

Flow Data Anomaly at S18C Identified and Corrected From QA/QC

1. INTRODUCTION

QA/QC is performed on selected hydro-meteorological data sets

It is a rigorous examination of the data to ascertain and/or improve its quality. It involves data investigation to detect anomalies, correction of the anomalies, and initiation of steps to prevent them from occurring again.

An example of data QA/QC is presented here for flow data at structure S18-C

Tools used include comparison of historical patterns, site knowledge, graphical inspection, communication with field personnel and hydraulic engineering staff, alternate data sets, mass balance analysis, and engineering know-how

2. SITE DESCRIPTION

S18-C structure is located near Florida City, Lat. 25 19 50 .42, Long 80 31 30 .21

Structure is a reinforced concrete gated spillway, controlled by two cable operated, vertical lift gates

Operation of the gates is automatically controlled in accordance with the operational criteria



USGS satellite water-stage recorder and AVM (acoustic velocity meter) are located approximately 0.22 miles downstream from S-18C structure.

The UVM system is used to compute discharge for S-18C canal under station number # 02290769

S-177, S-178 and S18C Structures



S-177 Structure



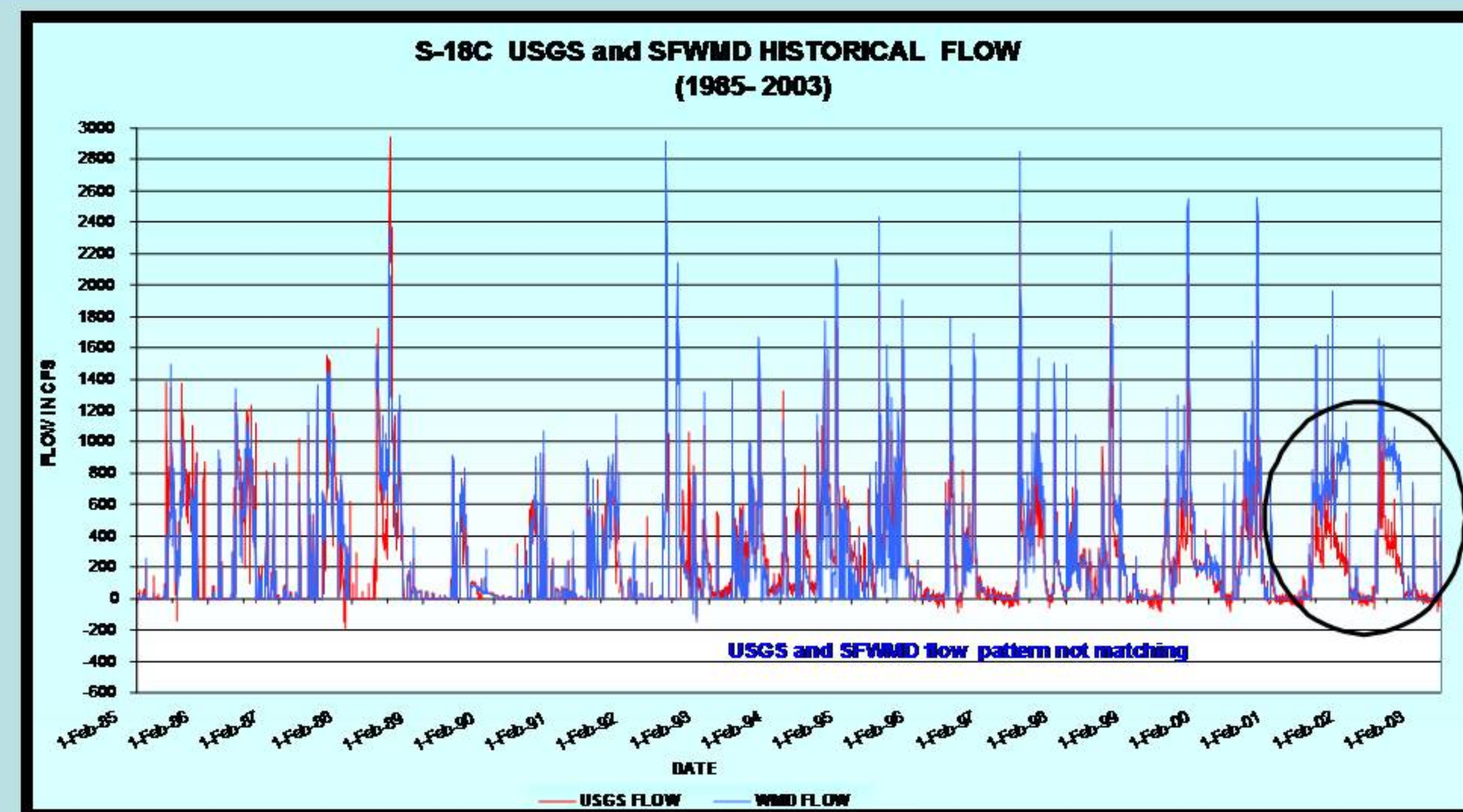
S-178 Structure



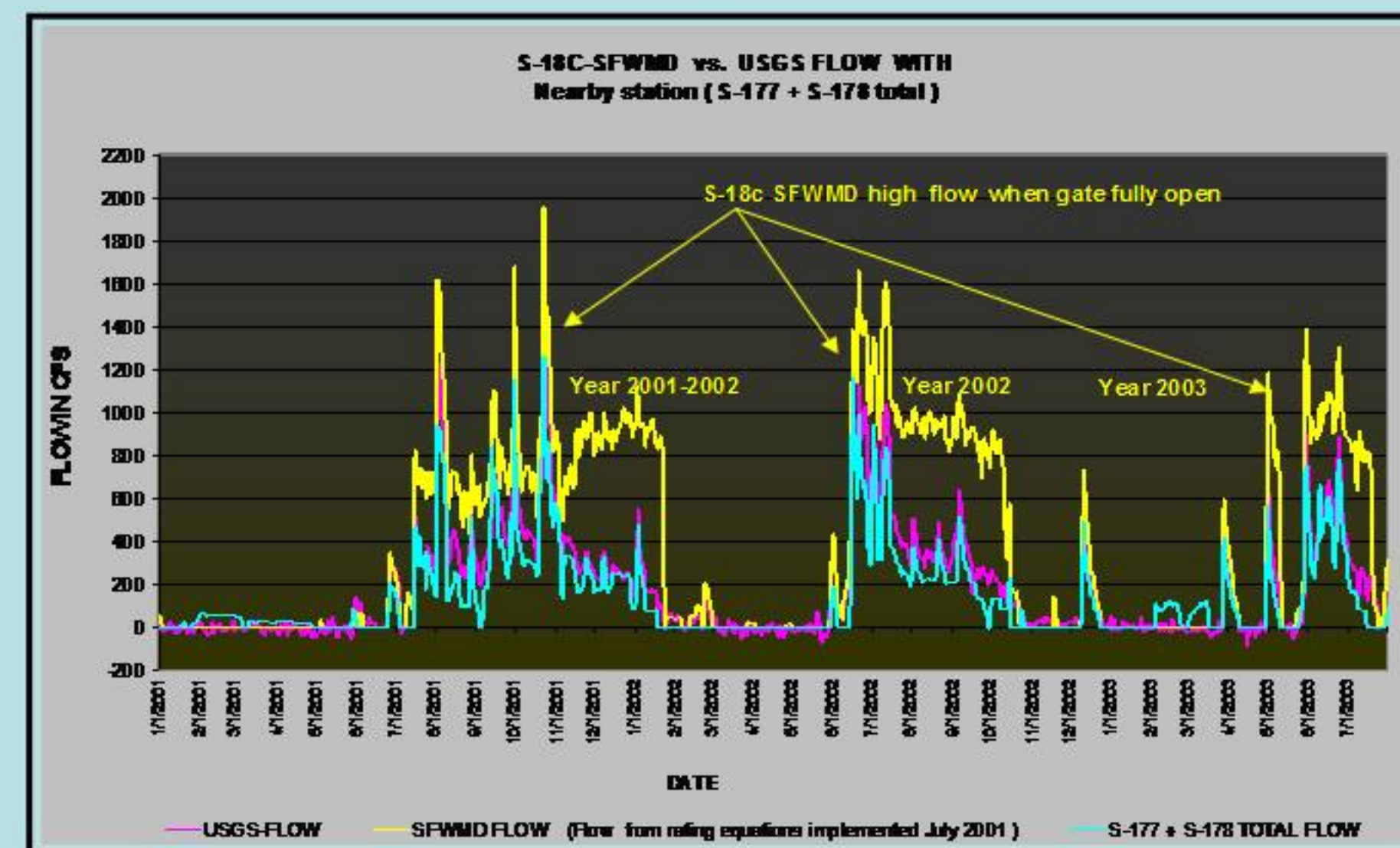
S-18C SPILLWAY STRUCTURE

The S-177 and S-178 discharges go through the S-18C structure as shown in this sketch

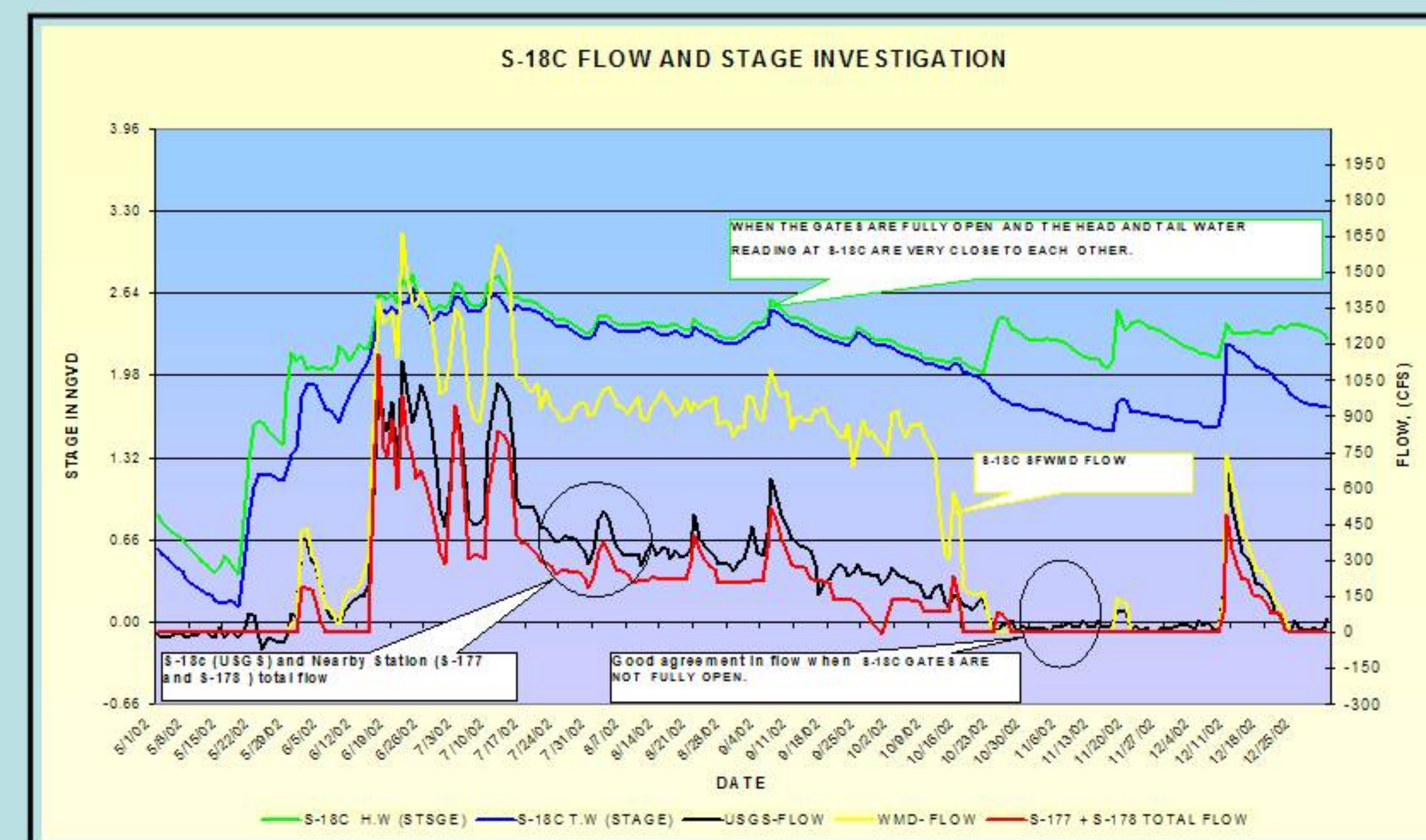
3. DATA INVESTIGATION FOR ANOMALY



Graph shows the historical comparison of USGS and SFWMD flows over the 1985 – 2003 period. Notice the data divergence between the two flow values in 2002 and 2003



This figure shows a close up view of the flow discrepancies

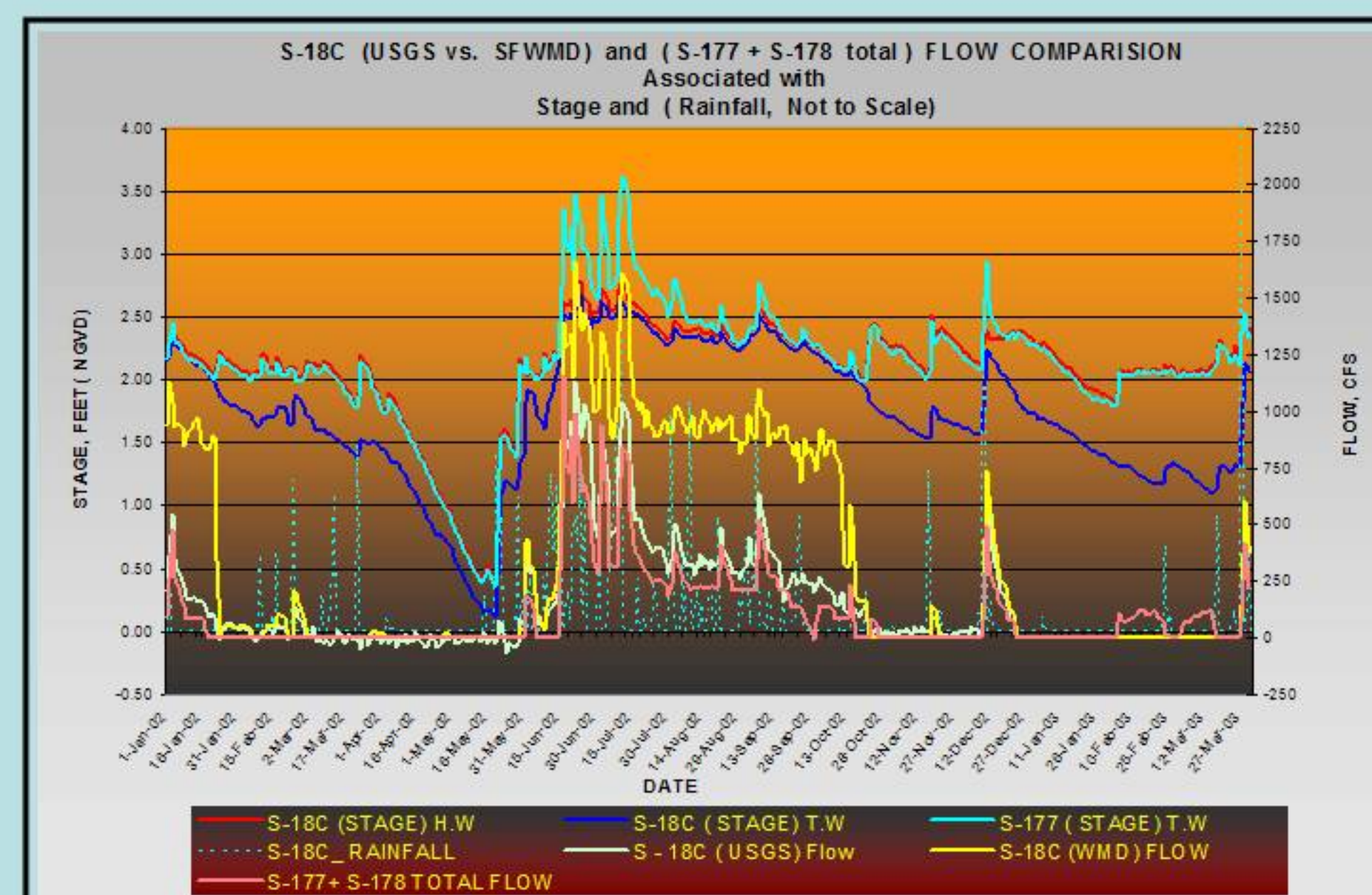


The 2002 to 2003 period is expanded in this graph. The SFWMD daily mean flows, when the gates are fully open, are 3 to 4 times larger than the mean UVM flow measured by the USGS

A graphical analysis combining headwater and tailwater stage elevations, rainfall, and flow is shown. It is observed that the flow discrepancy between the USGS and SFWMD flows are greatest when the headwater and tailwater elevations are very close to each other, and the gates are fully open. Under such a condition, the head differential is very small and the flow is uncontrolled.

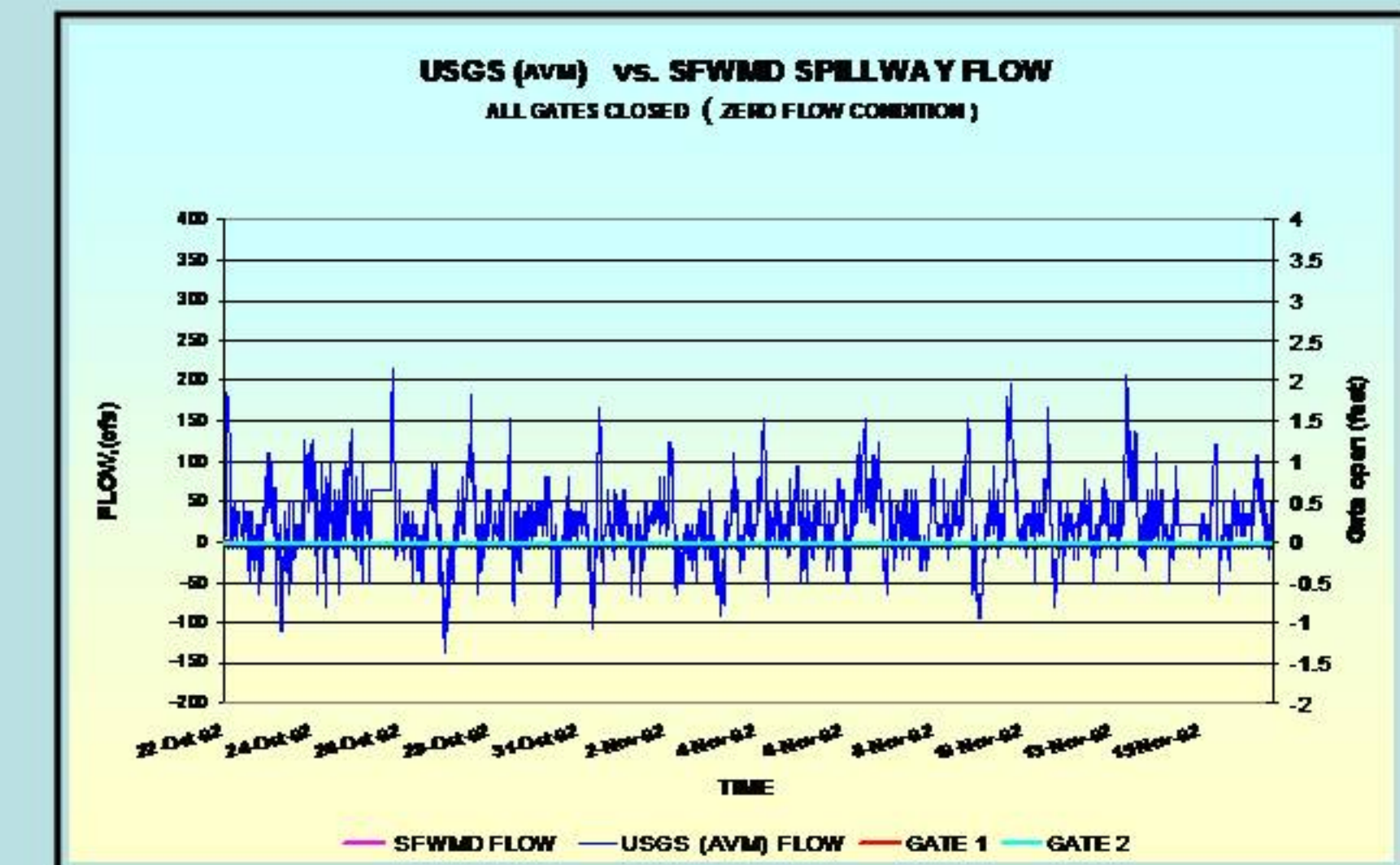
This observation suggests that the problem may be from the flow computation equations for the site.

This anomaly was then communicated to the hydraulic engineering staff for investigation and correction.

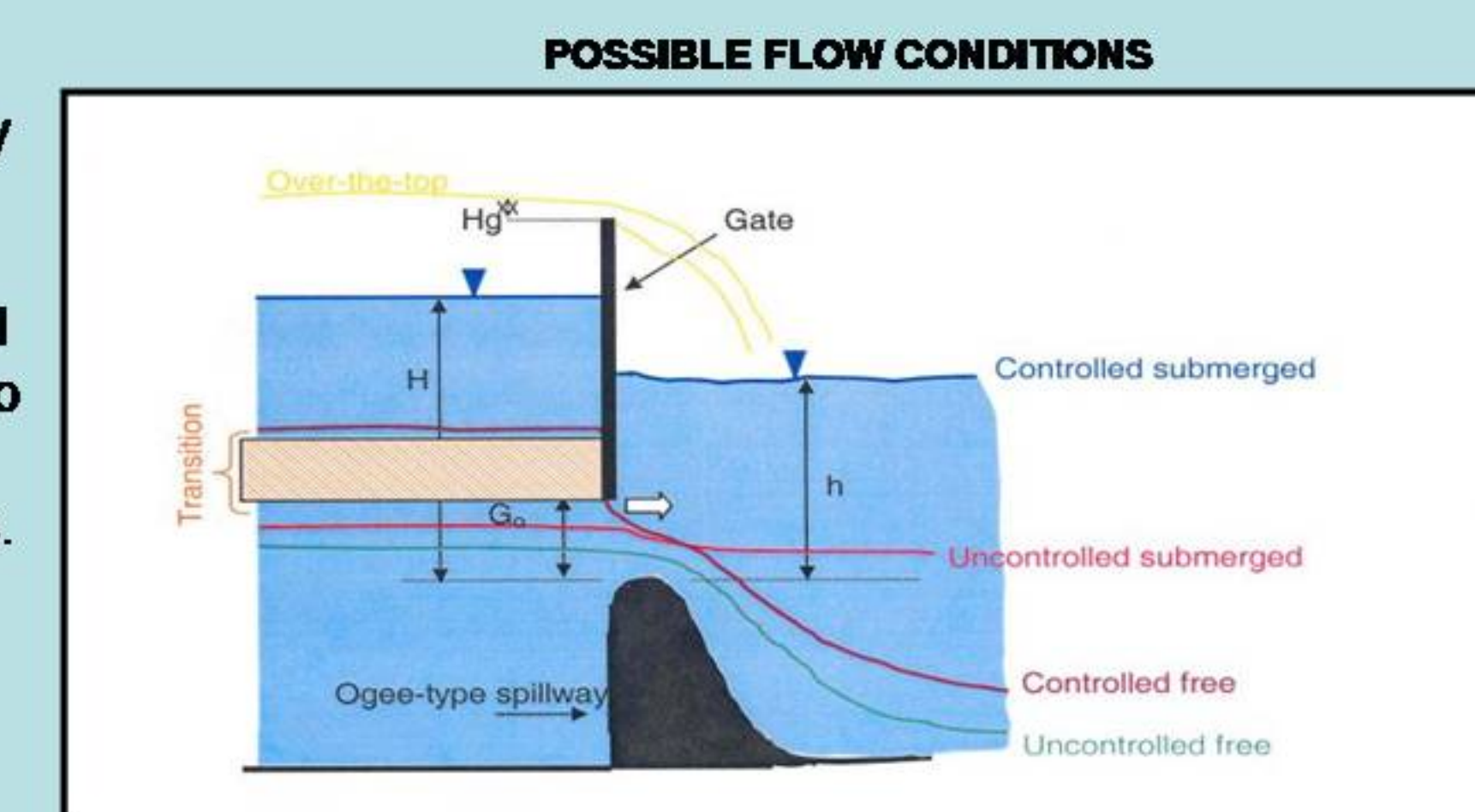


4. CORRECTION OF DATA ANOMALY

This Figure shows the limitations of flow from the UVM at S18C. In this case all gates were closed. Yet the UVM is reporting flows in the range of -150 to 200 cfs. This erroneous reporting is due to instrument noise and locally circulating flows (wind effects and secondary flows). Note, however, that the average flow is close to zero, in line with the fact that the gates are closed.

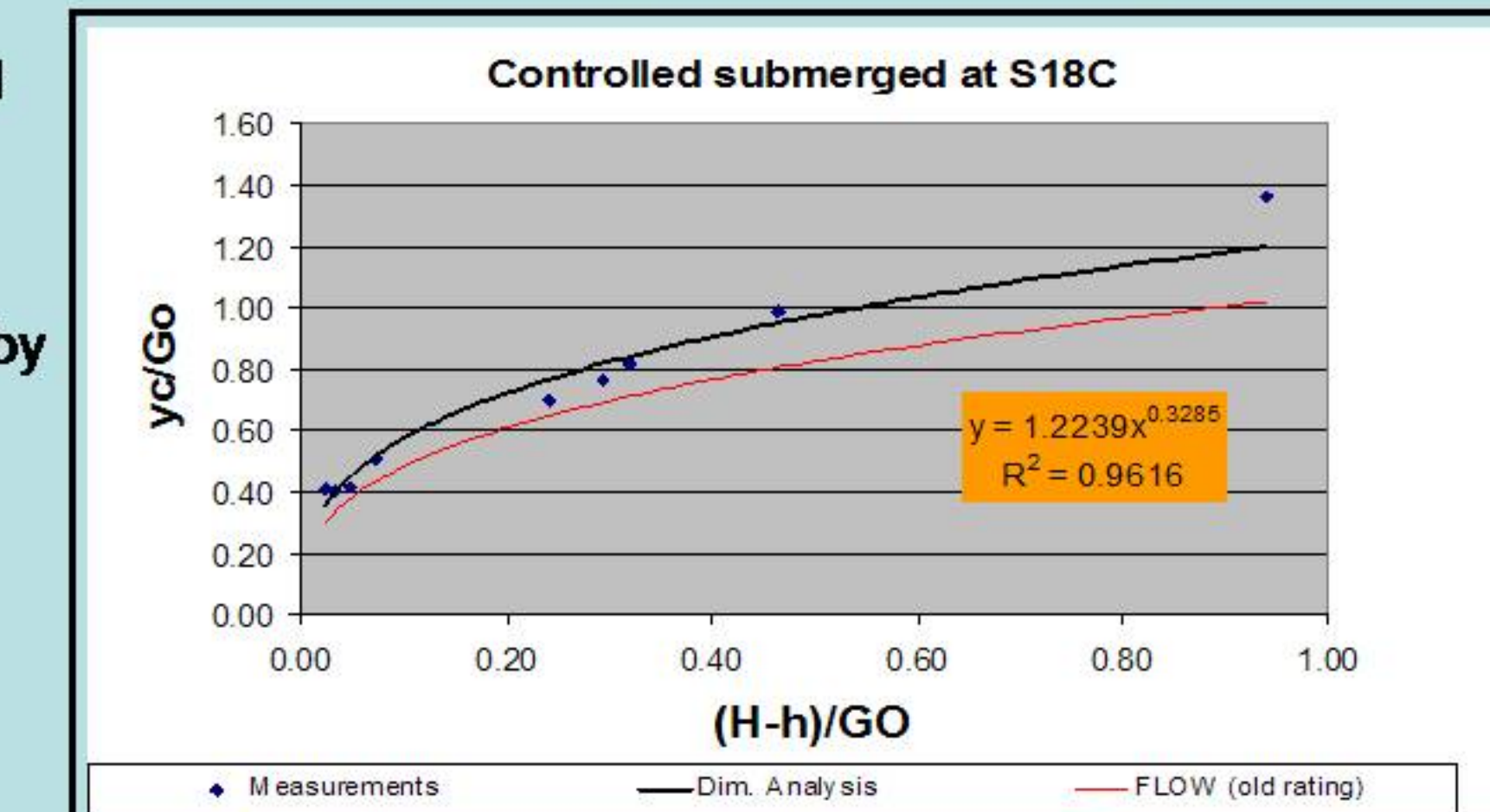


The possible flow conditions at a gated spillway are shown this figure. The are: controlled submerged, controlled free, uncontrolled submerged, uncontrolled free flows, transitional flows and over-the-top flows. However, only two flow conditions occur at S18C: controlled submerged and uncontrolled submerged flows.



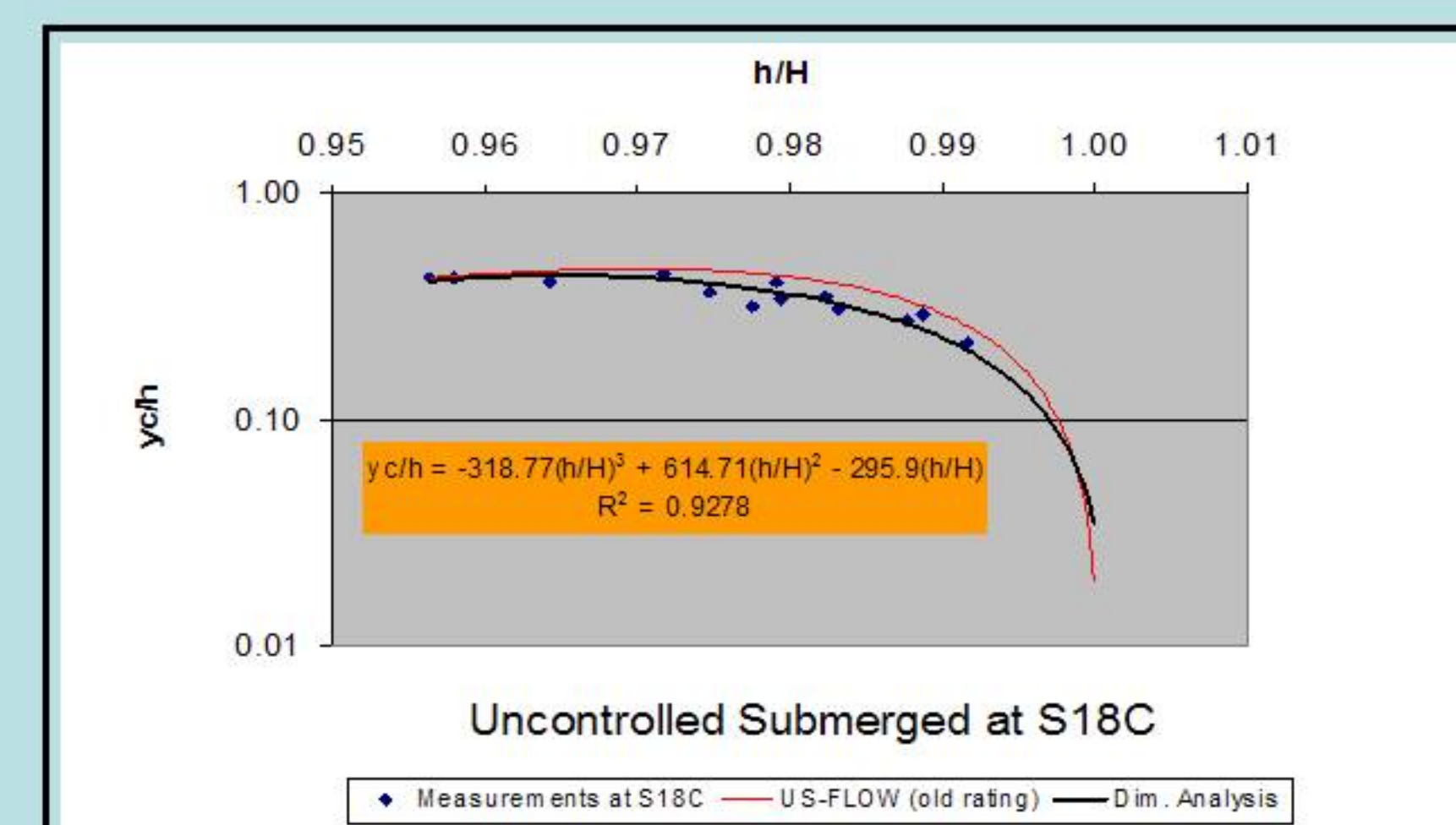
Controlled Submerged Flow at S-18c Spillway

Two flow rating curves were then developed for the two possible flow conditions. This figure shows the new (black line) and old ratings (red line) for controlled submerged flows. The old rating underestimates flows by about 22%



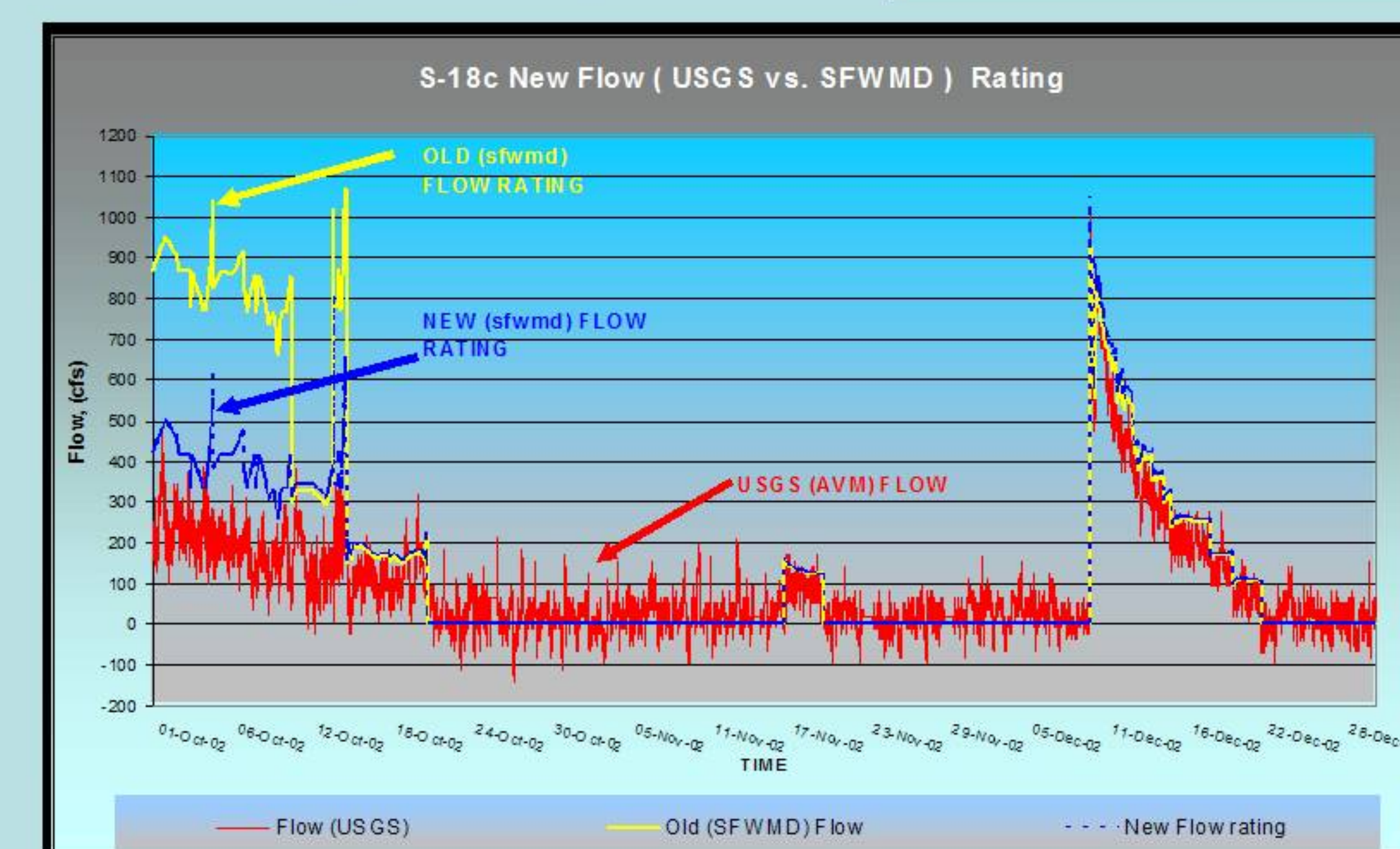
Uncontrolled Submerged Flow at S-18c Spillway

The next figure shows the new (black line) and old ratings (red line) for uncontrolled submerged flows. The old rating overestimates flows by about 25%



Summary of Errors

	Old Rating	New Rating
Uncontrolled Submerged	24.7%	1.96%
Controlled Submerged	-22.2%	0.70%
Overall	5.52%	1.45%



This figure shows the new historical flow time series based on the new rating curves versus the flow time series based on the old rating. The figure also show the USGS flow time series at S18C, and indicate that both are now comparable.